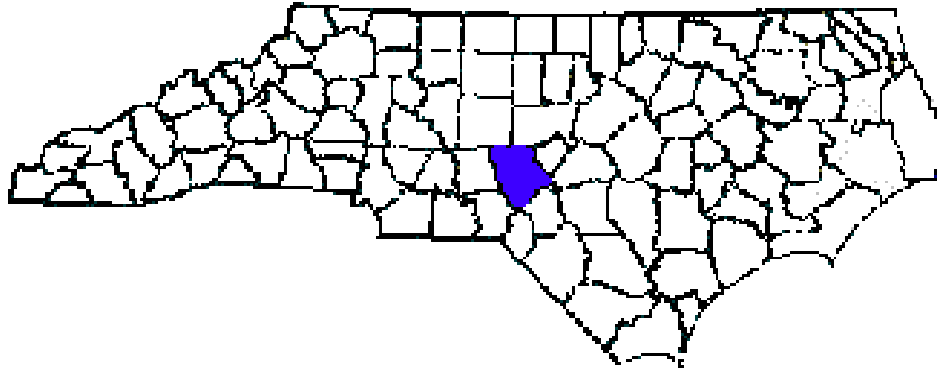


# ANNUAL REPORT FOR 2006



**Little River Bridge Mitigation Site  
Moore County  
TIP No. R-0210A**



Natural Environment Unit & Roadside Environmental Unit  
North Carolina Department of Transportation  
December 2006

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## **SUMMARY**

The following report summarizes the monitoring activities that have occurred in the 2006 at the Little River Bridge Mitigation Site. The 2006-year represents the first year of hydrologic and vegetation monitoring following construction. The site must demonstrate hydrologic and vegetation success for a minimum of five years or until the site is deemed successful. The site was constructed to serve as mitigation for impacts associated with the US 1 bypass in Moore County.

In February 2006, groundwater monitoring gauges were installed to monitor hydrology on the site. Four groundwater gauges and one rain gauge, were positioned on the restoration site. There are also three reference gauges that were installed prior to construction. The reference gauges are located directly adjacent to the constructed site, within the preservation area.

Hydrologic success criteria are based on the approved mitigation plan and require that the site demonstrate saturation or inundation within 12 inches of the soil surface for a consecutive 12.5% of the growing season during years of normal rainfall. The 2006-year represents the first year of hydrologic monitoring for the Little River Bridge Mitigation Site. Three of the four groundwater restoration gauges met the success criteria for 2006. The three existing reference gauges recorded jurisdictional hydrology above the required 12.5% of the growing season.

Vegetation monitoring in the restoration area yielded 603 trees/shrubs per acre. This average is above the minimum success criteria of 320 trees/shrubs per acre.

Based on the results from the first year of monitoring, NCDOT will continue to monitor vegetation and hydrology at the Little River Bridge Mitigation Site during 2007.

## 1.0 INTRODUCTION

### 1.1 Project Description

The Little River Bridge Mitigation Site serves (entirely) as mitigation for T.I.P R-0210A US 1 bypass in Moore County (Figure 1). The 14.8-acre site is located in Moore County, 0.75 miles southeast of the town of Vass and crosses over the Little River. Access to the site is via US 1 South Business on the northeastern boundary. The 14.8-acre site includes 6.4 acres of restoration and 8.4 acres of preservation of bottomland hardwood forest. Reference areas onsite were utilized to provide reference data for restoration monitoring.

### 1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetation monitoring must be conducted for a minimum of five years or until the site is deemed successful. Vegetation success criteria states that at least 320 trees/acre must survive through year three. A ten percent mortality rate will be accepted in year four (288 trees/acre) and another ten percent in year five resulting in a required survival rate of 260 trees/acre through year five. Hydrologic success criteria will be based on the approved mitigation plan and requires that the site demonstrate saturation or inundation within 12 inches of the soil surface for a consecutive 12.5% of the growing season during years of normal rainfall. Included in this report are analyses of hydrologic and vegetation monitoring results, discussions of local climate conditions throughout the growing season, and site photographs.

### 1.3 Project History

2005	Reference Gauges Installed
January 2006	Site Constructed
February 2006	Site Planted
February 2006	Monitoring Gauges Installed
March-November 2006	Hydrologic Monitoring (Year 1)
June 2006	Vegetation Monitoring (Year 1)



## **2.0 HYDROLOGY**

### **2.1 Success Criteria**

The hydrologic success criteria established for the Little River Bridge Mitigation Site, as stipulated in the approved mitigation plan and subsequent revisions, require that the site demonstrate saturation or inundation within 12 inches of the soil surface for a consecutive 12.5% of the growing season during years of normal rainfall.

The growing season in Moore County begins on March 23 and ends November 7. The dates correspond to a 50% probability that air temperature will drop to 28° after March 23 and before November 7<sup>1</sup>; thus, the growing season is 228 days. Local climate must represent normal conditions for the area.

### **2.2 Hydrologic Description**

Four groundwater monitoring gauges were installed within the sites restoration area (Figure 2) in February 2006. There are also three reference gauges that were installed prior to construction in the existing wetlands that are adjacent to the constructed site. A rain gauge is also located on the site to assist in comparison of the rainfall data (supplied by the NC State Climate Office) from an official weather station in Southern Pines. The groundwater gauges record water levels on a daily basis. Monitoring data for 2006 represents the first year of hydrologic monitoring for the site.

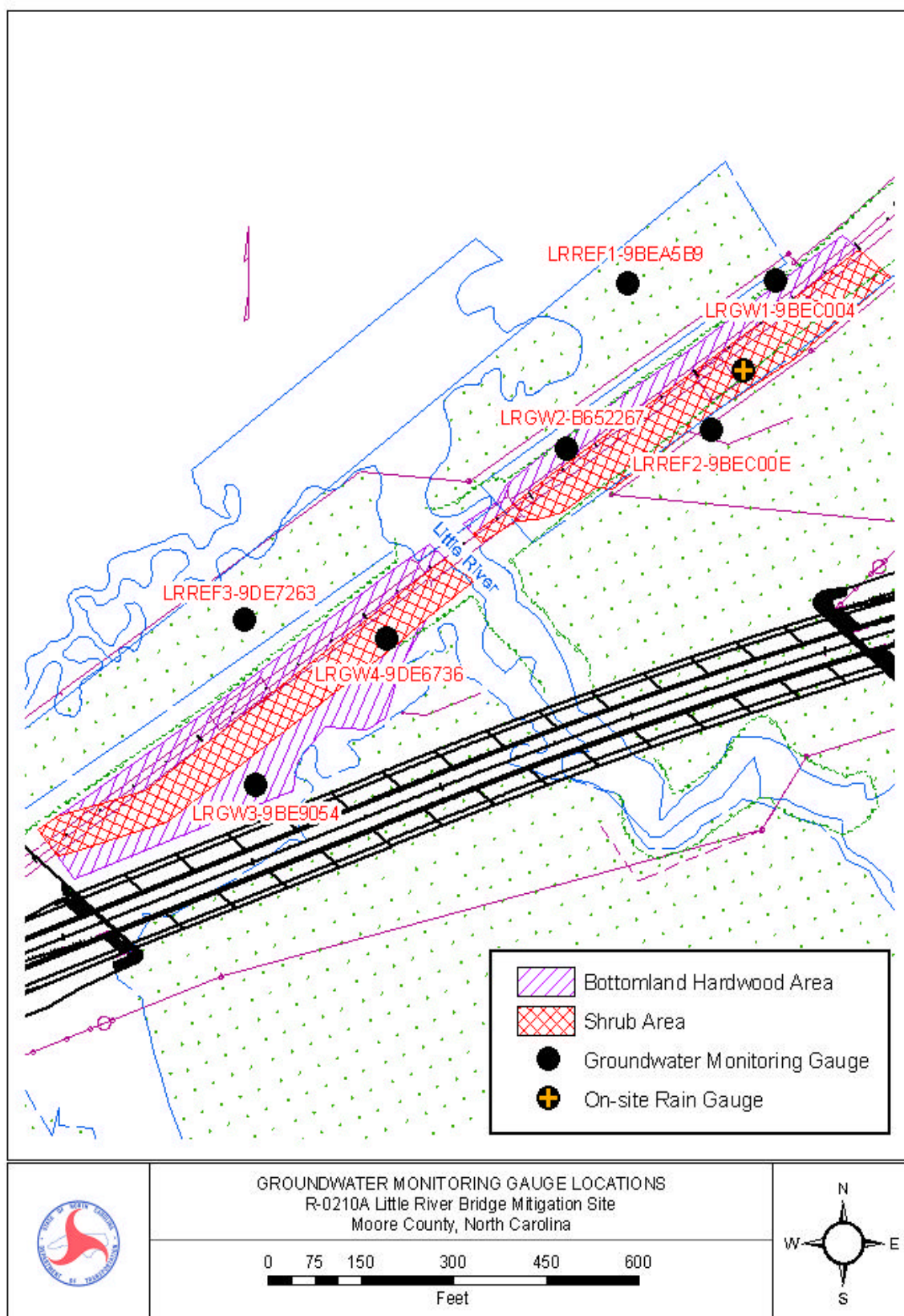
### **2.3 Results of Hydrologic Monitoring**

#### **2.3.1 Site Data**

The maximum number of consecutive days that saturation occurred within 12 inches of the ground surface was determined for each groundwater-monitoring gauge. This number was converted into a percentage of the 228-day growing season (March 23 – November 7). Table 1 provides the 2006 hydrologic results; Figure 3 is a graphical representation of these results. Appendix A includes graphs of the data recorded at each groundwater gauge. Daily rainfall events recorded at the onsite rain gauge (and supplemented by the data from the official weather station in Southern Pines) are included on each of the groundwater gauge plots.

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<sup>1</sup> Soil Conservation Service, Soil Survey of MooreCounty, North Carolina, 1995.



**Figure 2. Monitoring Gauge Location Map**

**Table 1. 2006 Hydrologic Monitoring Results**

Monitoring Gauge	< 5%	5-8%	8-12%	> 12.5%	Actual %
LR-GW1				X	15.4
LR-GW2				X	16.2
LR-GW3				X	14.0
LR-GW4	X				3.9
LR-REF1				X	13.2
LR-REF2				X	29.4
LR-REF3				X	13.2

Shaded gauges are reference gauges.

Groundwater Monitoring Gauge 4 is the only monitoring gauge that has not been successful in 2006. The close proximity to the Little River may be causing a draw-down effect on the gauge. NCDOT will continue to monitoring this gauge and may install additional gauges if necessary to determine whether or not wetland hydrology is present in this portion of the site.

### **2.3.2 Climatic Data**

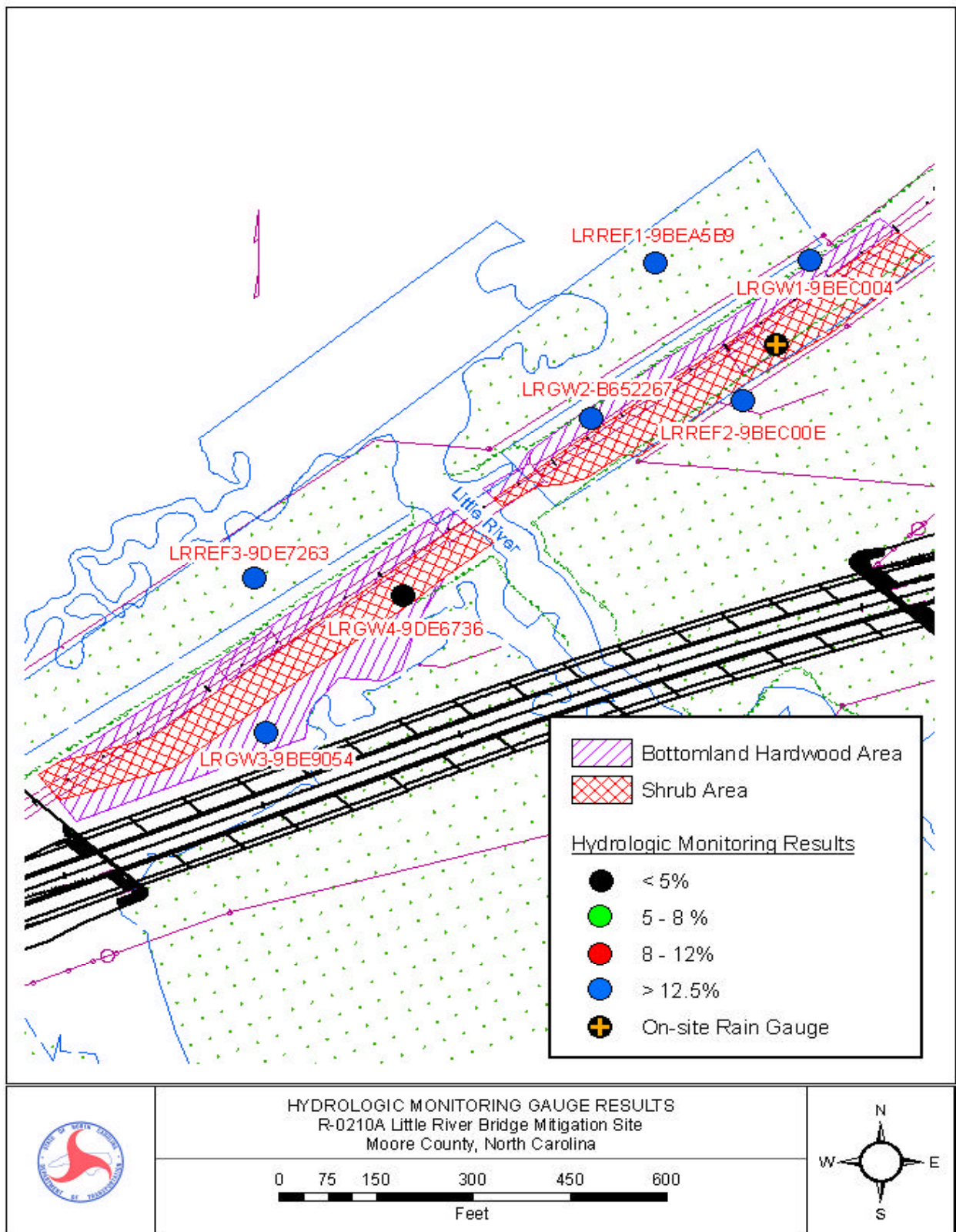
Figure 4 is a comparison of the 2006 monthly rainfall to the historical precipitation (collected between 1976 and 2006) for Carthage, North Carolina. This comparison gives an indication of how 2006 relates to historical data in terms of climate conditions. The NC State Climate Office provided all local rainfall information.

This graph is used to indicate the general precipitation conditions for the surrounding area. Overall, the 2006-year exhibited below average rainfall. The data obtained for the 2006-year indicates that rainfall going into the beginning of the 2006 growing season (January to March) as well as August, September and October tended to be on the low side of normal. The rainfall for the months of April, May and July were normal while the rainfall for June and November were well above normal.

## **2.4 Conclusions**

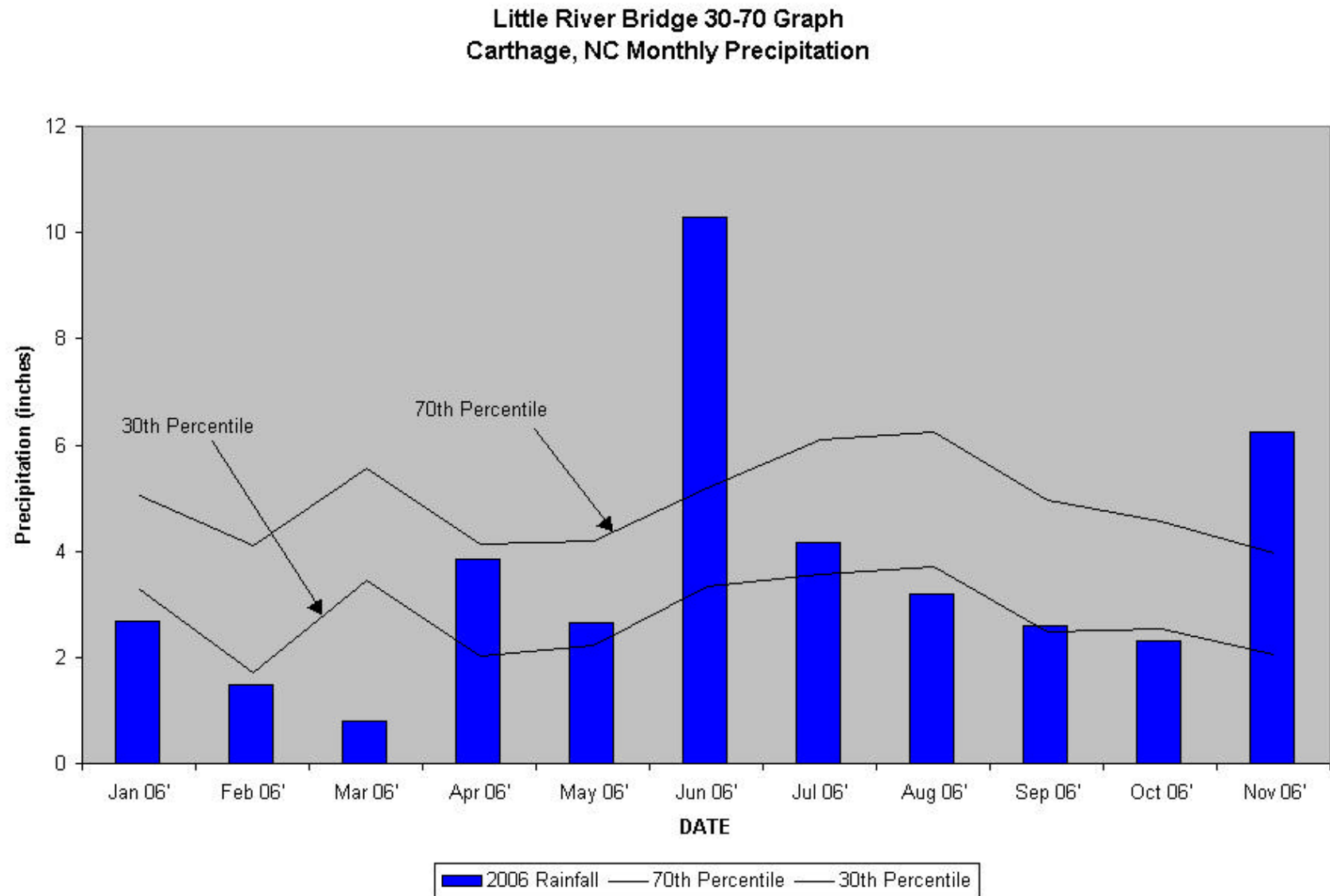
The 2006-year represents the first year of hydrologic monitoring for the Little River Bridge Mitigation Site. Three of the four groundwater restoration gauges met the success criteria for 2006. The three existing reference gauges recorded jurisdictional hydrology above the required 12.5% of the growing season.

NCDOT will continue to monitor the Little River Bridge Mitigation Site for hydrology.



**Figure 3. 2006 Hydrologic Monitoring Results Map**

**Figure 4.** 30-70 Percentile Graph, Raleigh, NC



### **3.0 VEGETATION: LITTLE RIVER BRIDGE MITIGATION SITE (YEAR 1 MONITORING)**

#### **3.1 Success Criteria**

Success Criteria states that at least 320 trees/acre must survive through year three. A ten percent mortality rate will be accepted in year four (288 trees/acre) and another ten percent in year five resulting in a required survival rate of 260 trees/acre through year five.

#### **3.2 Description of Species**

The following tree and shrub species were planted in the Wetland Restoration Area:

##### **Tree Area:**

*Taxodium distichum*, Baldcypress

*Nyssa aquatica*, Water Tupelo

*Quercus phellos*, Willow Oak

*Quercus michauxii*, Swamp Chestnut Oak

##### **Shrub Area:**

*Cephalanthus occidentalis*, Buttonbush

*Aronia arbutifolia*, Red Chokeberry

*Cornus amomum*, Silky Dogwood

*Alnus serrulata*, Tag Alder

### 3.3 Results of Vegetation Monitoring

Plot #	Baldcypress	Water Tupelo	Willow Oak	Swamp Chestnut Oak	Buttonbush	Red Chokeberry	Silky Dogwood	Tag Alder	Total (1 year)	Total (at planting)	Density (Trees/Acre)
1 (Trees)	2	7	10	33					52	60	589
2 (Shrubs)					1	1	11	35	48	53	616
Average Density (Trees & Shrubs/Acre)								603			

**Site Notes:** Other species noted: *Juncus* sp., goldenrod, pokeberry, smartweed, fennel, dogwood, and various grasses.

### 3.4 Conclusions

There were 2 vegetation monitoring plots established throughout the 4.7 acre planting area. The 2006 vegetation monitoring of the site revealed an average tree density of 603 trees/shrubs per acre. This average is well above the minimum success criteria of 320 trees/shrubs per acre.

### 4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The 2006-year represents the first year of hydrologic monitoring for the Little River Bridge Mitigation Site. Three of the four groundwater restoration gauges met the success criteria for 2006. The three existing reference gauges recorded jurisdictional hydrology above the required 12.5% of the growing season.

Vegetation monitoring yielded 603 trees/shrubs per acre. This average is well above the minimum success criteria of 320 trees/shrubs per acre.

NCDOT will continue to monitor the Little River Bridge Mitigation Site for vegetation and hydrology.

## **APPENDIX A**

### **GAUGE DATA GRAPHS**

## **APPENDIX B**

### **PHOTO AND VEGETATION PLOT LOCATIONS, SITE PHOTOS**

# Little River Bridge



Photo 1



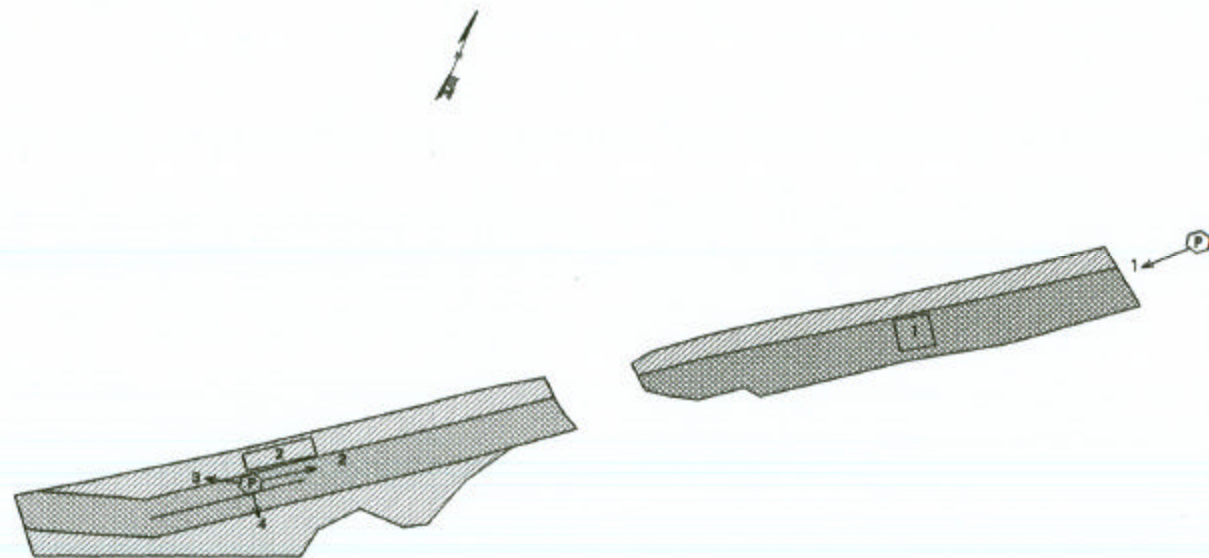
Photo 2








Photo 3



Photo 4



	Photo Point Locations
	Bottomland Hardwood Vegetation Plot
	Shrub Vegetation Plot
	Bottomland Hardwood Planting
	Shrub Planting

Vass Bypass - Little River Bridge